



Envirco™

*"Rethink . Recycle . Reuse . Restore . Renew
Sustainable environments for our future."*

ENVIRCO™ PROCESS STATEMENT OF TECHNOLOGY AND OPERATIONS PROCESS FOR TREATING ORGANIC WASTES

Mission Statement

Envirco, LLC of California, a California Limited Liability Company, is an environmental biotechnology company whose mission is to alleviate the global organic waste problem by treating such organic waste as a resource through a patented and proprietary Envirco™ process that efficiently converts biodegradable waste resources into organic fertilizer products. Envirco, LLC is a licensee and agent of the International Bio Recovery Corp. (IBR) of Vancouver, Canada technology (IBR Technology). Envirco™ utilizes the IBR technology to build, operate and own plants facilities to convert organic waste resources to organic fertilizer.

Waste Disposal Problem

There is a critical and a global problem as to how to dispose of biodegradable waste. The disposal of biodegradable waste has created many environmental issues nationally and internationally and has led to an increased emphasis on recycling and composting.

The EATAD technology, developed with the assistance of the National Research Council of Canada and the University of British Columbia, not only offers an economic and efficient method of processing biodegradable waste; but also converts this waste into valuable organic fertilizer. The spread of the world's population has reached over six billion. If nothing is done to control the birth rate number, this figure will double in the next 50 years, leading to impoverished soil, which will need to be reconditioned to avert erosion by wind and water. An organic fertilizer or supplement such as produced from biodegradable waste raises the prospect of solving this dilemma as well as the biodegradable waste concern.

The Envirco™ Solution for the Organic Waste

The organic waste processing facility ("Plant") proposed in this document is technically advanced and will meet the needs of local Waste Diversion Program. It will be recognized as the leading facility of its kind in North America. The design philosophy employed, demonstrates that organic waste is a resource to be recovered to complete the "earth to earth" cycle. The Plant exemplifies environmental leadership by demonstrating what a farm can do to optimize waste diversion and value recovery.

The Enhanced Autogenous Thermophilic Aerobic Digestion (EATAD) (the EATAD Process) is a patented, proprietary process, which uses thermophilic (heat responsive) microbes to process organic waste over a 72-hour period with zero harmful environmental discharge.

The EATAD Process converts high moisture, mixed organic waste generated from food sources, agricultural production, fish and livestock and municipal sewage sludge into valuable organic fertilizer or feed supplement to help alleviate the global organic waste problem.

The EATAD Process can keep biodegradable wastes, which create odors and leachate out of landfills so they will not pollute water resources such as rivers, streams, oceans and drinking water. The organic material, including food waste and food contaminated paper is processed in a completely enclosed system with no offensive odors, no harmful vectors or by-products – the end result is organic fertilizer high in organic nutrients and free of pathogens – harmless to humans and wildlife.

The EATAD technology features include:

- Process: A unique, aerated, thermophilic system that uniformly digests organics to a stable, consistent end product within six days;
- Flexibility: Can treat a broad spectrum of liquid and solid wastes over a large range of pH and solid content;
- Contaminants: Able to separate small amounts of inorganic impurities such as glass, metal and plastic to produce a clean product;
- Controlled Climate: Independent of climatic conditions;
- Usable Product: High Organic nutrient end product with high market value;
- Waste Stream: Completely closed system to eliminate odors and leachate; and,
- Green Process: Qualifies for greenhouse gas emission credits.

The EATAD Process

The EATAD process is a unique and proprietary fermentation technology called EATAD (Enhanced Autothermal Thermophilic Aerobic Digestion). In layman's terms, this means that once the slurry reaches a certain temperature (approximately 60 °C) it self-generates additional heat (autothermal); rising to very high temperature levels (thermophilic) consuming vast amounts of oxygen (aerobic) to completely convert the organic waste to single cell proteins (digestion). EATAD is an air-fed, fermentative, digestion process that kills ambient microbes, including pathogens, while achieving very high rates of reaction and conversion by the inoculated EATAD process microbes. The EATAD process operates at much higher temperatures than other similar processes that are currently used for converting organic wastes, including manure and sewage sludge. EATAD relies on a patented mechanical aeration device called the "Shearator" to achieve its extraordinarily high digestion temperatures, peaking at about 80°C. The EATAD process carefully controls feed selection and preparation, digestion temperature, rate of oxygen addition, acidity, and inoculation of the microbial regime.

The process requires effective separation that begins with the collection process. Feedstock suppliers need to remove non-organic (tramp) materials from their waste. After an inspection, the waste is fed into a macerator that pulps the organics to form a slurry. The EATAD macerator is a modified version of one commonly used in the pulp and paper industry. The macerator beats or pulps the waste rather than chopping or grinding. As a result most of any foreign materials such as plastic film, rubber bands, or wire remain intact. The lighter impurities are skimmed off the top while the heavier ones settle to the bottom of the "Y" tank. Other proprietary techniques are used for separating the solid and liquid products and drying and finishing them for use.

The EATAD End Product

The EATAD process produces a mixture of microbes, or "single cell protein" mass, and fermentation by-products that is essentially pathogen-free and contains many beneficial components. These components include certain specific microbes, organic acids, enzymes, "phytohormones" (or growth regulators) and other organic chemicals, especially humic acids.

These components, in turn, have beneficial effects on the physical properties of soil, soil retention of nitrogen, phosphorous and potash (NPK) nutrients and consequent nutrient uptake and plant growth. Of greatest potential value perhaps, is the suppression of disease in both roots and leaves/stems, which reduces or eliminates the need for plant protection applications such as fungicides and insecticides. Tests have been done of a spectrum of organic components in the product, primarily amino acids, as to the efficacy of their suppressing the growth of a wide spectrum of common crop plant-infecting fungal pathogens. Results indicate a high degree of suppression across the spectrum of Product components and pathogens.

The Product also supplies modest amounts of NPK major nutrients, and micronutrient fertilizer values. Some of these benefits are also widely recognized and valued in other organic-based fertility products such as composts, manures and humic/fulvic acid products (the latter of which are extracted from mined, lignite-like resources). However, unlike products made by anaerobically digesting (and aerobically stabilizing) municipal sewage sludge ("bio-solids"), the EATAD products are consistent, stable and extremely low in heavy metals content.

Unlike raw (or even composted) manure and other biomass used as fertilizer, the EATAD organic matter is fully converted, creating liquid and solid products that:

- Have consistent quality
- Are stable, odor-free, dust free and convenient for storage and shipping
- Have relatively high nutrient content
- Are non-pathogenic

These attributes are highly valued for agriculture and food production such as:

- Specialty agriculture - high end fruits and vegetables and certain cash crops
- Floriculture, gardening and horticulture
- Turf maintenance
- Also aquaculture, especially for shrimp farming, salmon and other fish.

The EATAD digestion technology converts organic waste materials into biological fertility concentrates engineered to reverse agriculture's growing reliance on pesticides, fungicides and chemical fertilizers. The products come in both granular (Genica SG-100) and liquid (Genica LC-200) forms and are concentrated, homogeneous, natural nutrient systems that rebuild damages, depleted soils and improve soil fertility year after year by improving the physical, chemical and biological properties of the soil.

Genica's SG-100 is a "pasteurized organic fertilizer" at less than 8% moisture content, which provides a complete nutrient and biological platform to enhance beneficial microbial populations and promote soil regeneration. Several crumble sizes allow for easy application using conventional commercial spreaders. Concentrated and uniform product, cost effective transportation and extended shelf life make this product ideal for commercial agriculture and golf course application.

Genica's LC-200 is a "pasteurized organic fertilizer extract" with a 35% solids concentration, which contains essential vitamins, amino acids, enzymes, plant hormones and organic acids for healthy plants and soil. Easy application with commercial sprayers, cost effective transportation and extended shelf life make this product ideal for commercial spray applications.

An EATAD Plant is totally equipped for processing and converting between 200 and 3,500 metric tonnes of organic waste per day. Its compact size and zero impact on the surrounding

environment means an EATAD Plant can be located close to the prime sources of organic waste materials and potential customers. Less hauling means fewer trucks and lower waste handling costs.

Process Verification

The EATAD process has been adapted from the Auto-thermal Thermophilic Aerobic Digestion (ATAD) process developed in Germany commonly used in the treatment of municipal wastewater sludge. Enhancements to the process, have broadened the ability of the process to handle a wide range of biodegradable material commonly encountered wastes.

Over the course of eight years, several independent studies have been completed on this process. Portions of reports verifying the process are included. Complete copies of these reports are available; however, they are not included in this proposal due to their large volume. The report references are:

- Enhanced Auto-Thermal Thermophilic Aerobic Digestion, Technology Fact Sheet for International Bio-Recovery Corporation, Environmental Technology Verification (ETV) Program, ETV Canada Inc. Burlington, ON, November 2000.
 - o “International Bio Recovery Corporation’s Enhanced Autothermal Thermophilic Aerobic Digestion (EATAD) process uses produce/restaurant waste as a feedstock. The waste stream is digested at 55-80°C for 60-100 hours to produce solid biological fertilizer for agriculture applications. When EATAD is operated in accordance with the IBR Operating Manual (July 2000), nutrients are conserved in the digestion process. Paired input and output secondary digesters samples showed no mean difference for total Kjeldhal nitrogen (TKN), phosphorous (P) and potassium (K) at a 99% confidence level.”
 - o “IBR’s EATAD technology is used for processing biodegradable organic waste such as food and vegetable waste, municipal solid waste (MSW), sewage sludge and animal manure. The IBR process is designed to convert organic wastes into pathogen free organic solid and liquid fertilizers.”
- The Strategic Enviro-technology Partnership (STEP) Green Book Technology Summary, Fertilizer Manufacturing Through Enhanced Autothermal Thermophilic Aerobic Digestion (ATAD), Bio-Dynamics LLC, West Concord, MA, May 12, 2000.
 - o “The STEP document seeks to characterize, in a concise manner, the main features of a manufacturing facility utilizing auto-thermal thermophilic aerobic digestion as a means of generating a microbial biomass product for use as fertilizer.”
- Preliminary Process Assessment For Conversion Of Vegetable And Fruit Waste To Value Added Products, BC Research Inc., Vancouver, BC, August 11, 1994
 - o “The IBR’s Autothermal Thermophilic Aerobic Digestion process has successfully produced a clean totally organic solid and liquid product, which contains high fertilizer values. Basically, the digestion process has accomplished two things:
 - The temperature of the fermenting slurry has been raised and maintained up to 65°C during the period of fermentation, which would kill disease causing agents and weed seeds.
 - Nutrients of the original plant material have been conserved.”

Greenhouse Gas Emissions Reduction

The Enhanced Auto-genus Thermophilic Aerobic Digestion (EATAD) process is an in-vessel digestion designed to rapidly degrade the organic waste material. The dairy manure is converted to stable high value liquid and dry organic fertilizers within 2 to 3 days.

The EATAD process may affect the green house gas (GHG) emissions as follows:

- (1) IBR process employs aerobic bacteria and provides sufficient air therefore; it does not create any methane (CH₄) emission from anaerobic digestion of the biodegradable waste material.
- (2) Application of the organic fertilizers results in long-term carbon storage in the form of undecomposed carbon compounds.
- (3) Non-biogenic CO₂ emissions from collection and transportation of the organic materials to the plant site.
- (4) Energy to provide aeration during the process and later to stabilize the organic material as liquid and dry fertilizers.

Greenhouse gas emissions are calculated for the United States.

Using Canadian standards, diversion of food scraps from landfills and via the EATAD process results in 80% reduction in green house gas emissions excluding carbon sequestration. Including carbon sequestration, this number increases to 85%. Using American standards, the process results in 116% reduction in GHG emissions (i.e. EATAD completely eliminates the emission of greenhouse gas emission and adds to the carbon storage by application of the organic fertilizers).

Delivery of Technology

The EATAD facility will be engineered, financed and owned by Enviroco and sized to the feedstock's requirements once a feedstock contract has been negotiated.

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